17MPS/FA
Open Drive Centrifugal Liquid Chillers

Installation Instructions

SAFETY CONSIDERATIONS

Centrifugal liquid chillers are designed to provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel.

Be sure you understand and follow the procedures and safety precautions contained in the machine instructions as well as those listed in this guide.

⚠ DANGER

DO NOT USE OXYGEN to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease and other common substances.

NEVER EXCEED specified test pressures. VERIFY the allowable test pressure by checking the instruction literature and the design pressures on the equipment nameplate.

DO NOT VALVE OFF any safety device.

BE SURE that all pressure relief devices are properly installed and functioning before operating any machine.

⚠ WARNING

DO NOT USE eyebolts or eyebolt holes to rig machine sections or the entire assembly.

DO NOT work on high voltage equipment unless you are a qualified electrician.

DO NOT WORK ON electrical components, including control panels, switches, starters or oil heater until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid-state components.

LOCK OPEN AND TAG electrical circuits during servicing. IF WORK IS INTERRUPTED, confirm that all circuits are de-energized before resuming work.

DO NOT syphon refrigerant by mouth.

AVOID SPILLING liquid refrigerant on skin or getting it into the eyes. USE SAFETY GOGGLES. Wash any spills from the skin with soap and water. If any enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

NEVER APPLY an open flame or live steam to a refrigerant cylinder. Dangerous overpressure can result. When necessary to heat refrigerant, use only warm (110 F/43 C) water.

DO NOT REUSE disposable (nonreturnable) cylinders nor attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinder is emptied, evacuate remaining gas pressure, loosen the collar and unscrew and discard the valve stem. DO NOT INCINERATE.

CHECK THE REFRIGERANT TYPE before charging machine. High pressure refrigerant in a low pressure machine can cause vessels to rupture if the relief devices cannot handle the refrigerant volume.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc. while machine is under pressure or while machine is running. Be sure pressure is at zero psig before breaking any refrigerant connection.

CAREFULLY INSPECT all relief valves, rupture discs and other relief devices AT LEAST ONCE A YEAR. If machine operates in a corrosive atmosphere, inspect the devices at more frequent intervals.

DO NOT ATTEMPT TO REPAIR OR RECONDITION any relief valve when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. Replace the valve.

DO NOT VENT refrigerant relief valves within a building; refer to ANSI/ASHRAE 15-1978. The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

DO NOT install relief valves in series or backwards.

USE CARE when working near or in line with a compressed spring. Sudden release of the spring can cause it and objects in its path to act as projectiles.

⚠ CAUTION

DO NOT STEP on refrigerant lines. Broken lines can whip about and cause personal injury.

DO NOT climb over a machine. Use platform, catwalk or staging. Follow safe practices when using ladders.

USE MECHANICAL EQUIPMENT (crane, hoist, etc.) to lift or move inspection covers or other heavy components. Even if components are light, use such equipment when there is a risk of slipping or losing your balance.

DO NOT WELD OR FLAME CUT any refrigerant line or vessel until all refrigerant has been transferred from the vessel to storage.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER. Open the disconnect *ahead of* the starter in addition to shutting off the machine or pump.

USE only repair or replacement parts that meet the code requirements of the original equipment.

DO NOT VENT OR DRAIN water boxes containing industrial brines, liquid, gases or semisolids without permission of your Process Control Group.

DO NOT LOOSEN water box cover bolts until the water box has been completely drained.

DOUBLE-CHECK that coupling nut wrenches, dial indicators or other items have been removed before rotating any shafts.

DO NOT LOOSEN a packing gland nut before checking that the nut has a positive thread engagement.

PERIODICALLY INSPECT all valves, fittings and piping for corrosion, rust, leaks or damage.

PROVIDE A DRAIN connection in the vent line near each pressure relief device to prevent a build-up of condensate or rain water.

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INTRODUCTION

General — The purpose of this book is to provide general installation information for Carrier 17MPS/FA centrifugal refrigeration machines.

Because of the design flexibility of the 17MPS/FA machine system, this book cannot provide instructions for all possible component combinations or arrangements. *In all cases, the individual job data must be considered the primary source of information for installation procedures.*

Typical refrigeration system components may include the following: (Since responsibility for supplying these may vary, a check list is provided on which the supplier can be indicated.)

Component	Carrier MSD	Others
Compressor	☐	☐
Coolers	☐	☐
Condenser	☐	☐
Economizer	☐	☐
Safety Controls	☐	☐
Receiver	☐	☐
Pumpout Unit	☐	☐
Interconnecting Pipe	☐	☐
Auxiliary Lubrication System	☐	☐
Soleplates	☐	☐
Couplings	☐	☐
Gear	☐	☐
Drive	☐	☐
Purge (Machine)	☐	☐
Refrigerant	☐	☐
Oil	☐	☐

Miscellaneous: coupling guards, starters, steam condenser, gas bypass valves, isolation springs, liquid feed valves, special relief valves, thermometers, wiring, base, rigging, gaskets, flanges, bolts, weld rings, cleaning materials, stage drains, installation labor, pipe dope, welding rod, coupling grease, solder, testing instruments, isolation valves, service valves, control piping and fittings.

In all cases the refrigeration flow diagram and/or packing lists indicate who is responsible for supplying any particular component.

Job Data — Additional information required for proper installation includes:

Machine Location Prints
Foundations and Contact Surfaces
Machine Assembly Drawing
Refrigeration Flow Diagram
Piping Prints and Details
Field Wiring Drawings
Vendor Instructions for Coupling, Gear and Drive
Standard Service Techniques Book, SM-15.
Installation Instructions for 5F20 Pumpout Compressor

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RECEIVING MACHINE

Depending upon machine size and configuration, 17MPS/FA machines may be shipped as factory assembled packages. These packages contain a holding charge. *Do not open valves or break any connection on such machines.*

Inspect Shipment – Carefully check for shipping damage while the machine or component is still on the shipping conveyance. If machine appears damaged, or if it has been torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim papers directly to the transportation company.

Carrier Machinery and Systems Division will not be responsible for any damage incurred in transit.

Check all items against shipping list. Notify Carrier Machinery and Systems Division immediately regarding missing items.

To prevent damage or loss, leave all parts in their original containers until installation.

Machine Identification – Check model and serial number of each major machine component against job data records. This is particularly important where 2 or more machines are being erected at a single jobsite.

The compressor nameplates are located on the end of the compressor casing opposite the drive end.

The heat exchanger and receiver nameplates are normally located on a vessel support foot. Machine configuration, however, may require mounting the nameplate on vessel shell or end-flange.

Machine Protection – Protect machine, drive and starting equipment from construction dirt and moisture. Keep all protective covers in place until ready for installation.

If the machine will be exposed to freezing temperatures after the water circuits have been installed, open the water box drains and drain all water from cooler and condenser. Leave the drains open until system is to be refilled. Drain all water from compressor oil cooler coil, and from auxiliary and drive oil coolers, if supplied. Disconnect the water lines and use compressed air to remove the water from the oil coolers.

Rigging the Machine – 17MPS/FA machines are supplied in a variety of configurations to match individual job requirements. For this reason, rigging weights, dimensions and points of lift must be obtained from the individual job data.

Rigging Gear and Drive – Follow manufacturer's installation instructions for rigging this equipment.

MACHINE FOUNDATIONS – SETTING MACHINE

Refer to Carrier Standard Service Techniques Book, SM-15 for the basic procedures of preparing foundations and setting the centrifugal machine.

The following setting and alignment instructions are to be used in conjunction with those in the Standard Techniques book and in accordance with the information on job machine arrangement drawings.

Compressor – The compressor is usually shipped with soleplates and shims installed. If, however, the soleplates are shipped separately, proceed as follows:

1. Remove skids, clean compressor feet and lower compressor to just above the soleplates.
2. Insert approximately .125-in. of shims between each compressor foot and soleplate, as shown in Fig. 1.
3. Position compressor on soleplate so that hold-down bolts are as close to the center of the footing holes as possible (Fig. 1).

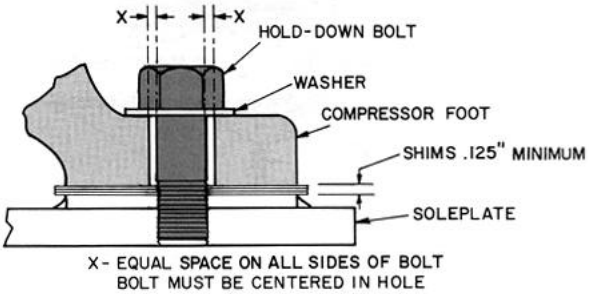

Fig. 1 – Machine Footing Hold-Down Bolt Arrangement

The compressor with soleplates attached now forms a single piece of equipment which must be set in the exact position shown on the job blueprints. See Fig. 2. Align all other machine components to the fixed compressor after it has been installed. Final compressor alignment requirements are:

1. Horizontally (axially) level.
2. Shaft parallel to and in line with scribed centerline on foundation.
3. Suction flange plumb.
4. Height as specified on blueprints.
5. Coupling hub face located as specified on blueprints.

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LEVELING THE COMPRESSOR

1. Level compressor with jacking screws provided. Place 2 x 4 x 1/2-in. steel jacking blocks under the screws (Fig. 2) to distribute the compressor weight.

> CAUTION: Never strike the compressor or soleplate directly with a hammer. Move compressor with jacking block, hydraulic jack or by striking the compressor footing with a timber. Use a block of wood against footing to distribute the force.

2. Compressor soleplates must be set at least 1 1/2-in. above the base to allow for grouting. Recheck the job blueprints to ensure proper compressor location.
3. Level the compressor both axially (lengthwise) and transversely (sidewise) by transit sightings along the compressor horizontal split line (Fig. 3).

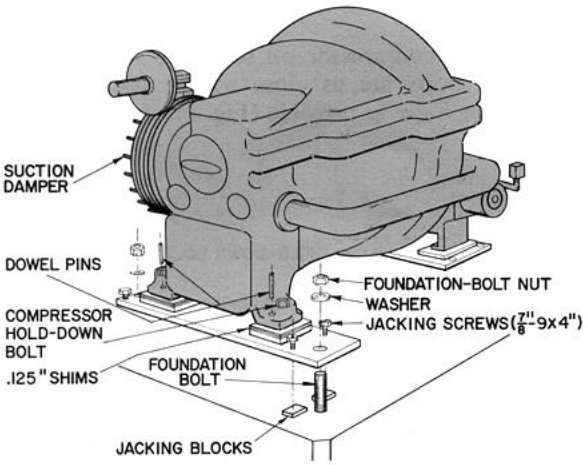

Fig. 2 — Setting Compressor

ALIGNING COMPRESSOR SHAFT

To align the compressor shaft with the scribed centerline on the foundation:

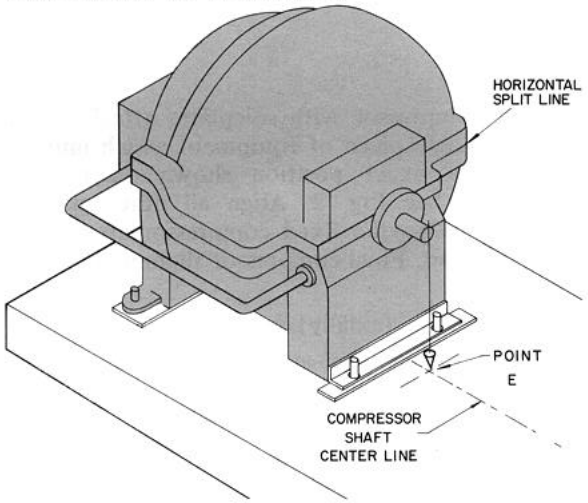

Fig. 3 — Leveling Compressor

A. If the suction and discharge flange surfaces are accessible as shown in Fig. 4, stretch a wire parallel to the scribed centerline on the foundation. Align the compressor so that the distance from the wire to each flange is identical.
B. If the compressor has adaptor pieces or other attachments on suction and/or discharge flange, drop a plumb line along the line of the flange surfaces and measure from plumb mark to scribed centerline on foundation.

After shaft alignment has been completed, coupling hub face must be directly over scribed mark E (Fig. 3).

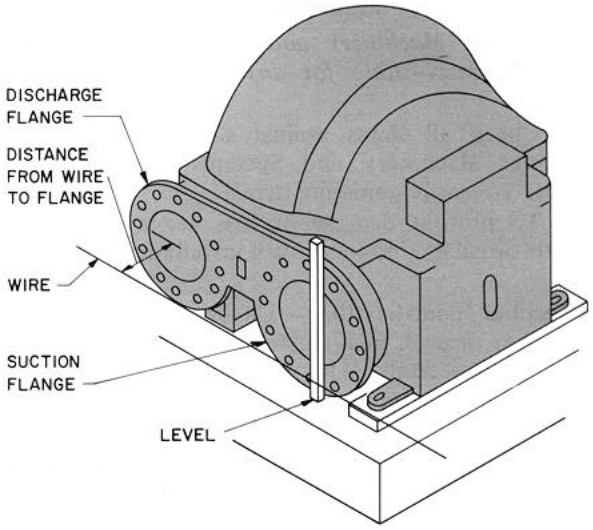

Fig. 4 — Compressor Alignment

SECURING COMPRESSOR ALIGNMENT

When the compressor is in its final position, secure it solidly to the foundation without disturbing the alignment. Work on each corner of the compressor as follows:

1. Mount an externally supported dial indicator (Fig. 5) against the compressor foot and set indicator at zero to allow plus or minus readings.
2. Place a washer and nut on the foundation bolt.

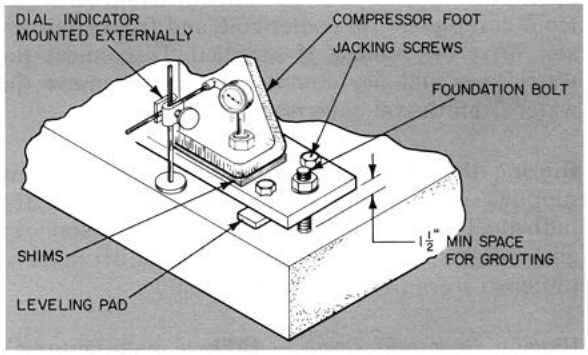

Fig. 5 — Securing Compressor Alignment

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3. Alternately tighten foundation-bolt nut and adjust jacking screw as required to bring indicator back to zero.

Do not dowel compressor until hot alignment check has been completed (SM-15, Rev A).

Heat Exchangers — Refer also to machine arrangement drawings and to Standard Service Techniques Book, SM-15.

Depending upon job requirements, the suction, discharge and economizer connections may be bolted flanges or welded pipe.

Before moving cooler into alignment with compressor, be sure that the suction damper (Fig. 2) has been installed on the compressor and that the suction damper blade moves freely.

1. Position and level the cooler as specified on job blueprints and as described in Standard Service Techniques Book, SM-15.
2. Remove protective covers from suction, discharge and economizer connections and clean and deburr all mating surfaces. Cover cleaned surfaces of mating flanges with light oil.
3. Check all openings to be sure that no foreign material has been deposited in the vessels. All rust flakes or mill scale must be removed.
4. Use weld rings on all field refrigeration system welds to keep weld spatter from pipe interior.
5. Take care not to damage gasket material with weld heat.
6. Cut notches in gaskets (Fig. 6) to allow use of thickness gages when joining flanges.
7. Be sure that gaskets are pliable when applied.
8. Place gaskets in position on flanges.
9. Place dial indicators against compressor to indicate any compressor movement. Use care in aligning and check dial indicators after each heat exchanger adjustment. Although the compressor will normally return to its zero position if moved a few thousandths of an inch, permanent movement requires resetting the compressor.
10. Check flange studs for hole clearance and alignment. Check flange surfaces for parallel alignment by using thickness gage at the gasket notches.
11. When flanges have reached close and even contact, apply light oil to studs and tighten nuts evenly. Following the sequence indicated in Fig. 6, tighten in about 3 stages, and apply a final uniform torque of 600 ft-lb or over.
12. *Check that compressor alignment is undisturbed.*

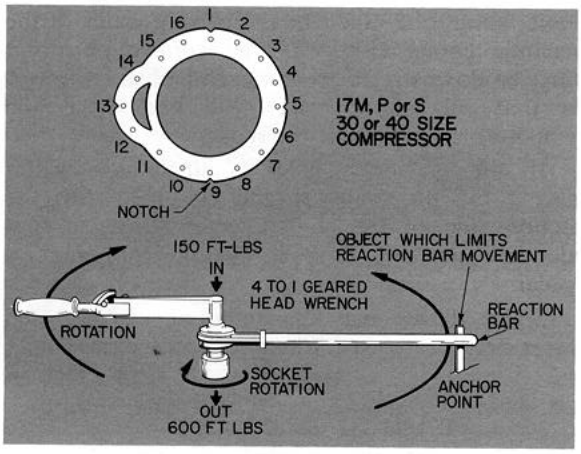

Fig. 6 — Suction Flange and Gear Head Wrench

Coupling Installation and Alignment — Install coupling halves on shaft ends before rigging gear and drive into close position.

Install and align couplings in accordance with coupling manufacturer's instructions and the procedures given in Carrier Standard Service Techniques Book, SM-15.

Gear and Drive Alignment — Obtain setting and alignment procedures from job drawings, manufacturer's installation instructions and from Carrier Standard Service Techniques Book, SM-15.

Place shafts at the exact coupling hub to hub distance shown on job drawings and as specified by the coupling manufacturer. Compressor and drive components should be aligned with shafts in the following positions:

Compressor — in thrust position (away from drive)
Turbine — in thrust position (towards compressor)
Gear — low speed shaft in thrust position (towards compressor)
Motor — at magnetic center (usually indicated by scribe mark on shaft)

Motor must be rechecked to ensure that shaft operating point and coastdown position do not cause coupling hub-face contact or binding of coupling shrouds. Check motor manufacturer's recommendations when limited end-float coupling is used.

PIPING

Cleanliness — Dirt and other material can cause considerable damage within a refrigerant system. Carefully inspect all openings and piping to ensure that no foreign matter has entered the machine. Cover all openings when not in use. Clean and wipe refrigerant pipe and remove all rust and scale before installing. Use weld rings to prevent slag or weld spatter from entering pipe or vessel.

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Machine Protection — Guard machine insulation against weld sparks or open flame. An asbestos or wet canvas cover is suggested.

Protect items such as gaskets, threaded joints, switches and other machine parts from weld heat damage. *Remove chilled water sensor (Fig. 7) when welding water box nozzle.*

Workmanship and Materials — Use materials consistent with good piping practice and the job pressure and temperature levels. Inquiries regarding proper materials and practices may be made to Carrier Machinery and Systems Division, Carrier Corporation, Syracuse, New York.

Be sure that pipe expansion and contraction due to welding does not move machine components out of line.

COPPER TUBING – All gage and control tubing should be 3/8 in. OD minimum. Use type "L" hard copper for refrigeration duty.

SOLDER JOINTS – Clean all joints thoroughly and apply flux to both sections before brazing. Use a good grade of solder with a silver content of not less than 35%. Clean all joints after brazing.

THREADED JOINTS – Check all joints for thread condition and proper fit. Then assemble, using a refrigerant sealant such as Loctite or John Crane Plastic Lead Seal. Apply sealant per manufacturer's instruction.

Water Piping to Cooler and Condenser — Install water piping per job piping prints and details, and with provisions outlined below:

1. Arrange pipe connections so that water box covers can be removed for maintenance and clearance is available for tube cleaning or removal.
2. Provide connections in water piping for required gages, thermometers and flow switches.
3. Install air vents at all high points to remove air and prevent water hammer.
4. Install pipe hangers so that there is no weight or stress on water box nozzles or flanges. On spring mounted machines, pipe hangers and pumps must be spring mounted.
5. Direct the water flow as indicated on machine assembly drawing.
6. Install water flow switches at top of pipe on horizontal run. Locate at least 5 pipe diameters from bends (Fig. 7).

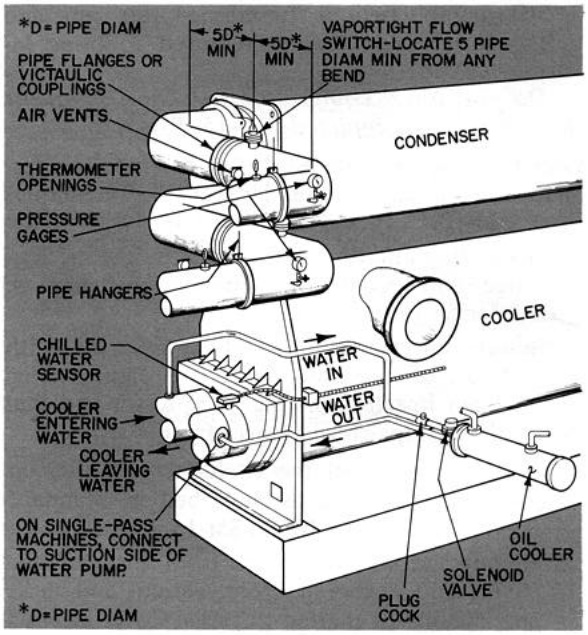

Fig. 7 — Typical Nozzle Piping

Water to Oil Coolers — Check job piping prints and flow diagrams for piping details and connections. The oil coolers for gear and drive must be piped per manufacturer's instructions.

Water supply to the compressor oil cooler may be city water or chilled water. City water must be clean and noncorrosive. *Water side erosion or corrosion of the oil cooler coil may lead to extensive machine damage not covered by the standard warranty.* Pipe city water to an open sight drain.

If machine chilled water is used for oil cooling, it should enter the oil cooler from the entering water of the machine cooler. Water leaving the oil cooler should be piped to the leaving water of the machine cooler (Fig. 7). The connection point must be downstream from the chilled water sensor so that oil cooler water will not affect the temperature readings of the sensor.

If the machine cooler is single-pass, water leaving the oil cooler should be piped into the suction side of the chilled water pump so that adequate pressure drop is assured thru the oil cooler.

Sight glasses may be required when closed water circuits are used. Check your job data.

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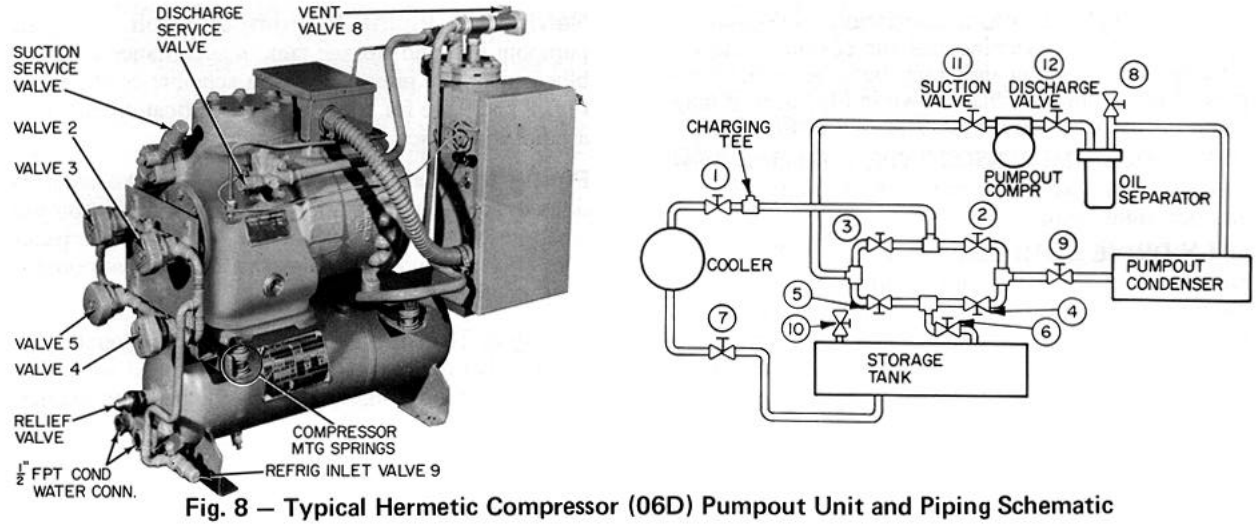

Fig. 8 — Typical Hermetic Compressor (06D) Pumpout Unit and Piping Schematic

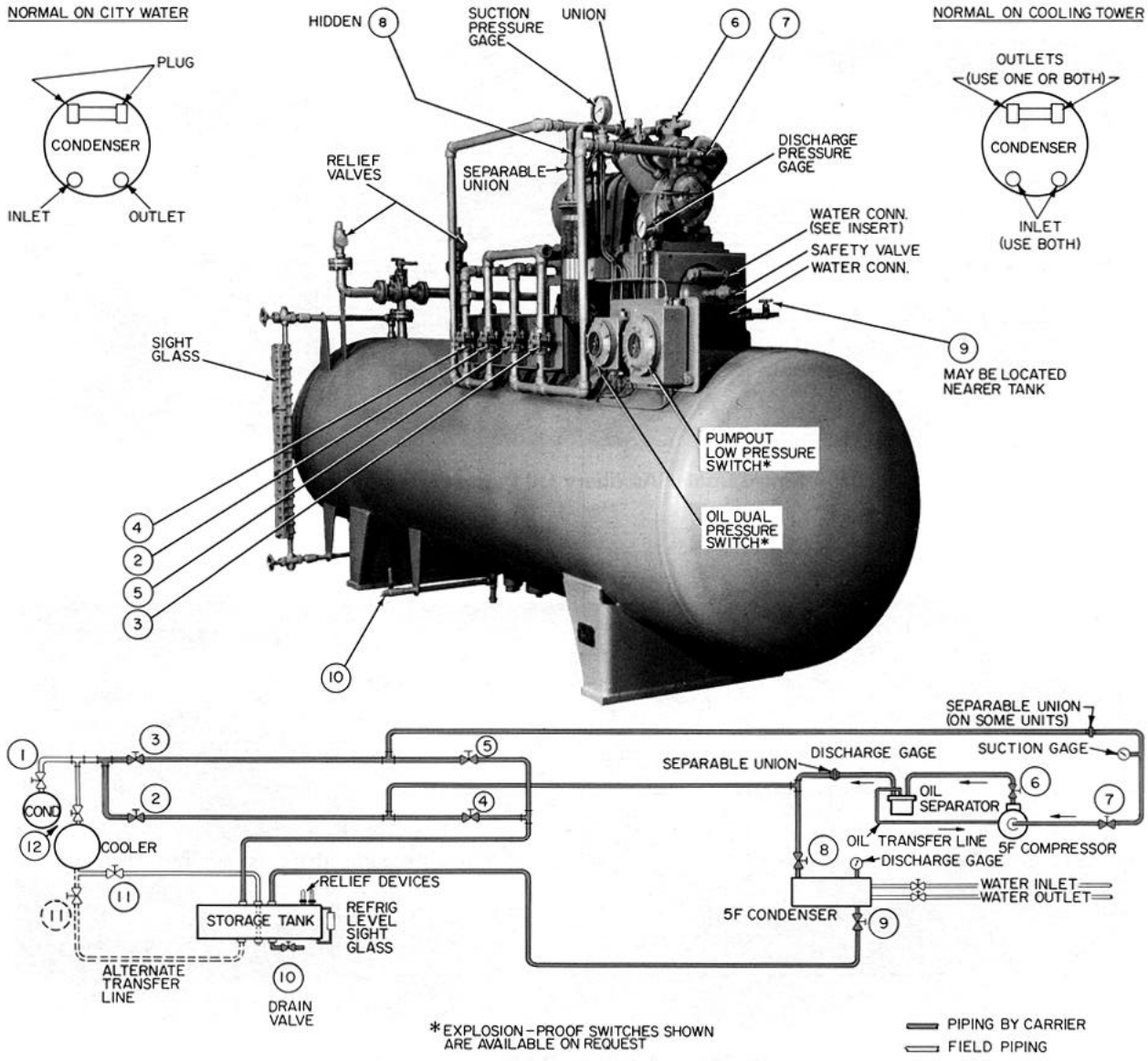

Fig. 9 — Typical Open Drive (5F) Pumpout Unit and Piping Schematic

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Water Piping to Pumpout Condenser — Depending upon refrigeration machine size and customer considerations, the pumpout unit may be a hermetic compressor type similar to that shown in Fig. 8, or it may be an open compressor type as shown in Fig. 9.

HERMETIC COMPRESSOR TYPE — Condenser water connections are shown in Fig. 8. Pipe city water to an open sight drain.

OPEN DRIVE COMPRESSOR TYPE — When ample water pressure is available (normal on city water), use maximum pass arrangement as indicated in Fig. 9. Use a minimum pass arrangement when water pressure is low or when cooling tower water is used. Pipe city water to open sight drain.

Refrigerant Piping to Pumpout Unit — Install pumpout unit and storage tank in accordance with job blueprints. The pumpout piping schematics shown in Fig. 8 and 9 are for component identification only and are not to be used for installation.

Piping to Auxiliary Oil Pump — Make connections to auxiliary oil pump system as indicated on job blueprints. Typical single cooler and double cooler packages (Fig. 10 and 11) are shown for general component identification only.

→ **Piping to Thermal Purge —** A remote-mounted automatic thermal purge (Fig. 12) is supplied with most high pressure machines. Connect the purge to the ma-

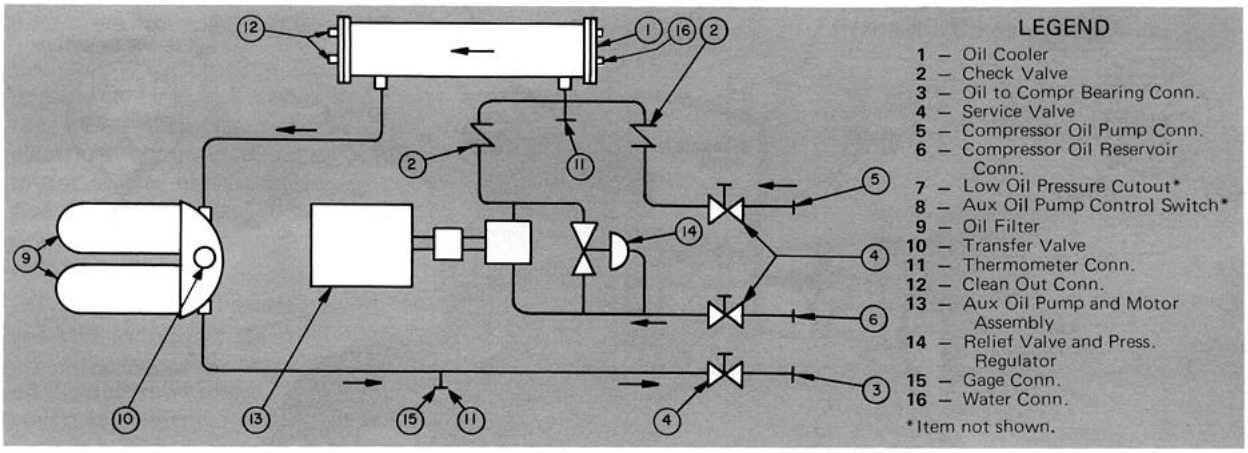

Fig. 10 — Single Cooler Auxiliary Oil Pump Piping Schematic

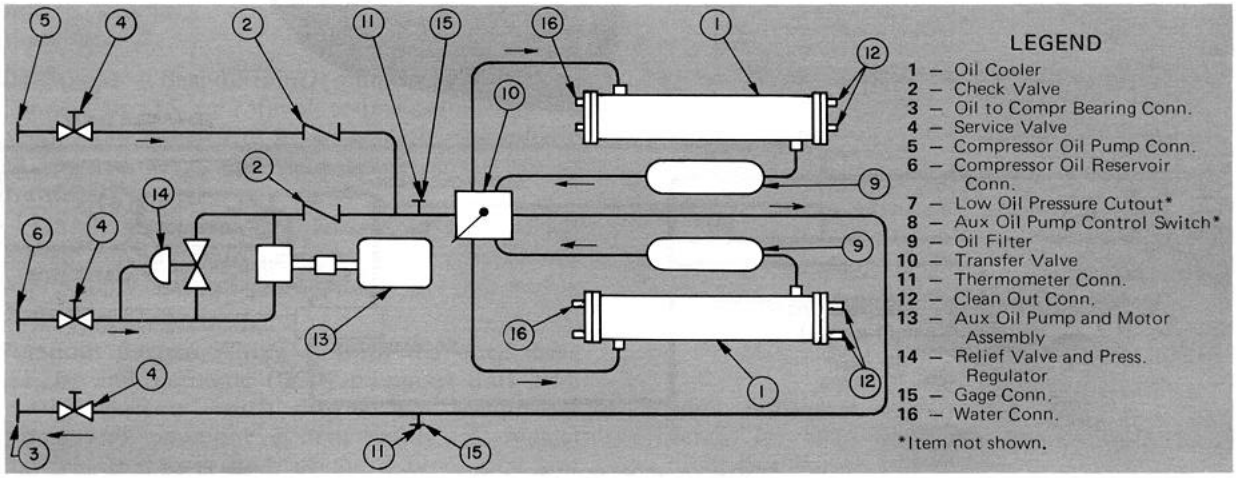

Fig. 11 — Dual Cooler Auxiliary Oil Pump Piping Schematic

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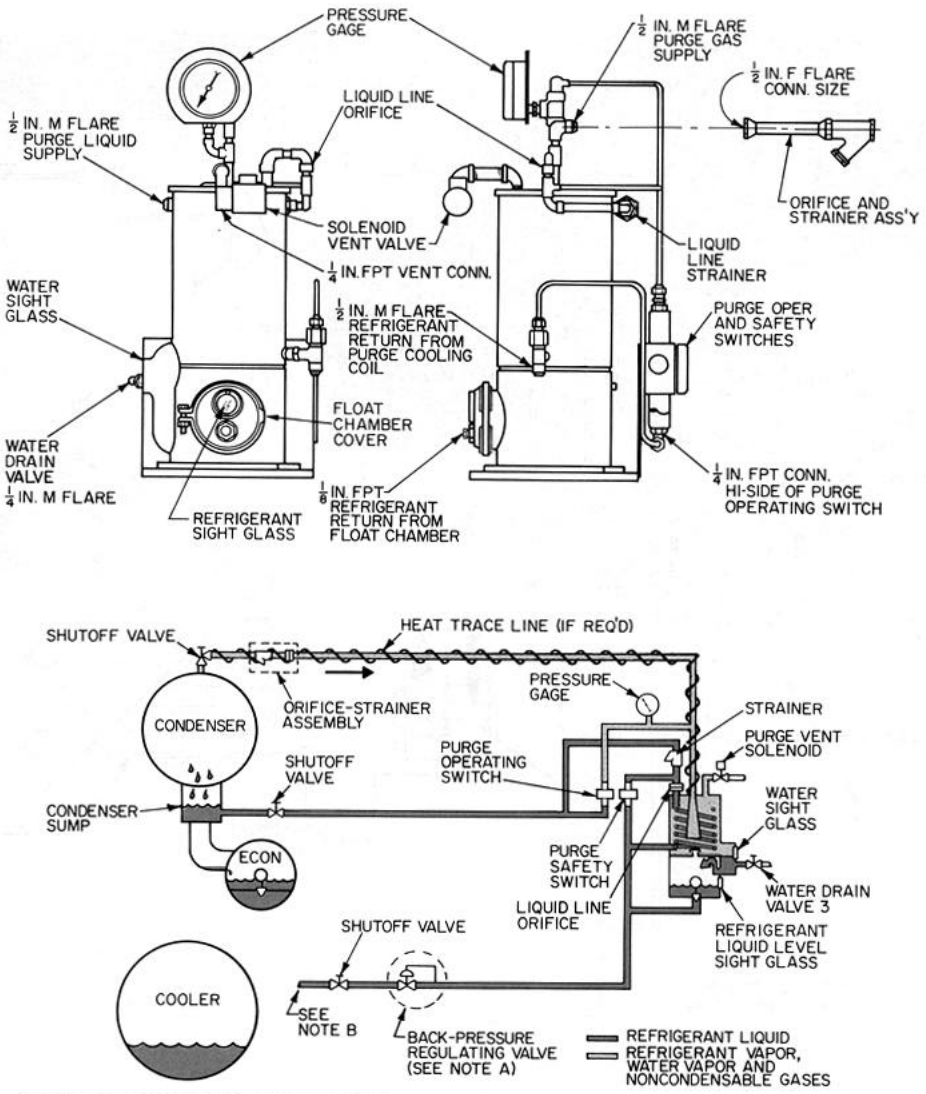

Note A: Used on low temperature applications – see text.
Note B: Purge refrigerant is returned to cooler or to economizer depending on operating temperatures.

Fig. 12 – Automatic Thermal Purge and Piping Schematic (Typical)

chine as shown on job drawings. An orifice strainer assembly is shipped with the purge unit. Install this assembly in the gas supply line near the condenser.

On machines with evaporator temperatures below 32 F, the purge refrigerant returns to the economizer. If the economizer temperature is also below 32 F, a back pressure regulating valve is required. Set the valve at 34 F or above, and install in the refrigerant return line (Fig. 12).

The purge and piping schematic shown in Fig. 12 is for general reference and component identification. Check your individual job drawings for actual purge configuration.

Piping to Type "L" Motorized Purge – 17MPS/FA machines designed for low temperature duty may have a compressor purge similar to that shown in Fig. 14. Connect purge to machine as shown on job flow diagrams. The type "L" purge piping schematic, Fig. 13, is supplied for general information and component identification purposes only.

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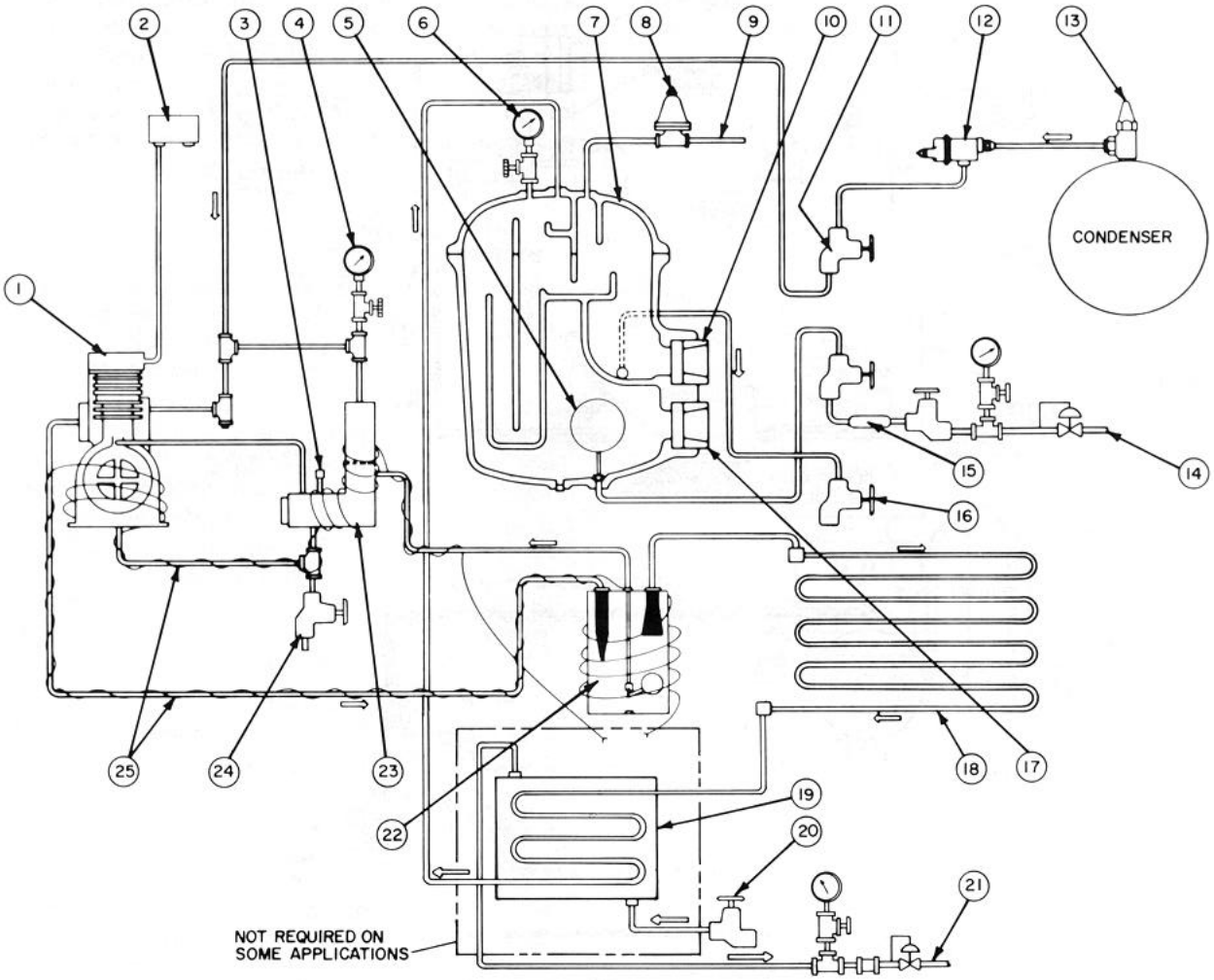

1 – Compressor
2 – High Pressure Cutout Switch
3 – Oil Fill Plug
4 – Suction Pressure Gage
5 – Refrigerant Float Valve
6 – Discharge Pressure Gage
7 – Purge Separation Chamber
8 – Automatic Relief Valve
9 – Vent to Atmosphere
10 – Water Level Sight Glass
11 – Suction Line Stop Valve
12 – Pressure Reducing Valve
13 – Stop Valve
14 – Refrigerant Return Line
15 – Refrigerant Line Drier
16 – Water Drain Valve
17 – Refrigerant Level Sight Glass
18 – Air-Cooled Condenser
19 – Refrigerant-Cooled Condenser
20 – Coolant Supply Line
21 – Coolant Return Line
22 – Oil Separator
23 – Auxiliary Oil Reservoir
24 – Oil Charging or Drain Valve
25 – Heat Trace Wiring

Fig. 13 – Type "L" Purge Piping Schematic (Typical)

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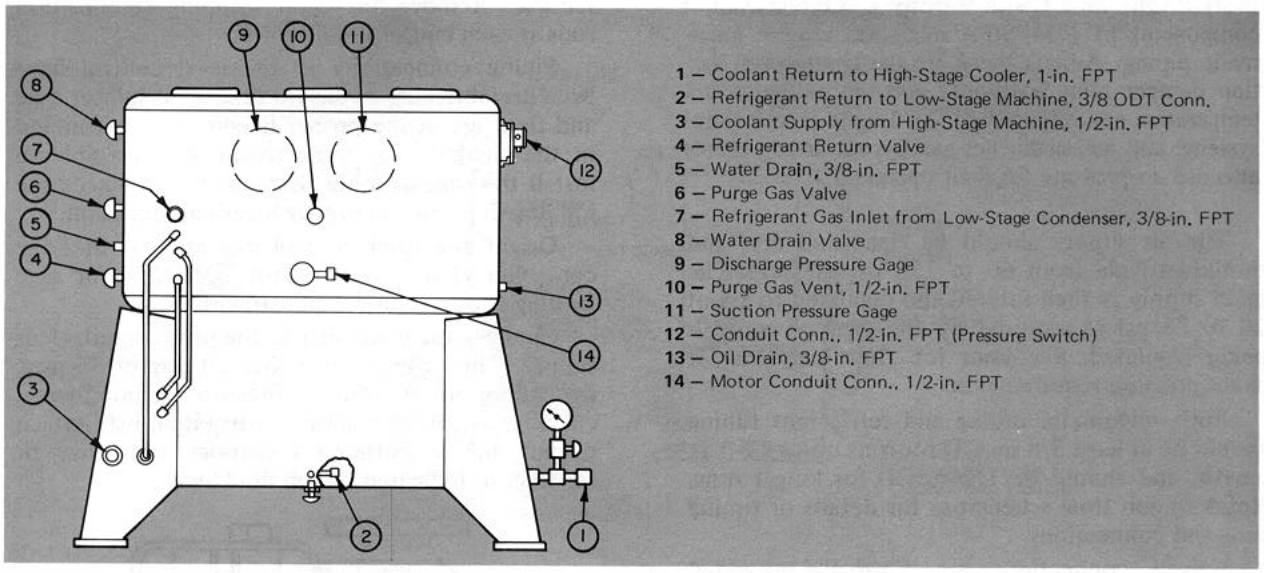

Fig. 14 – Type "L" Motorized Low-Temperature Purge (Typical)

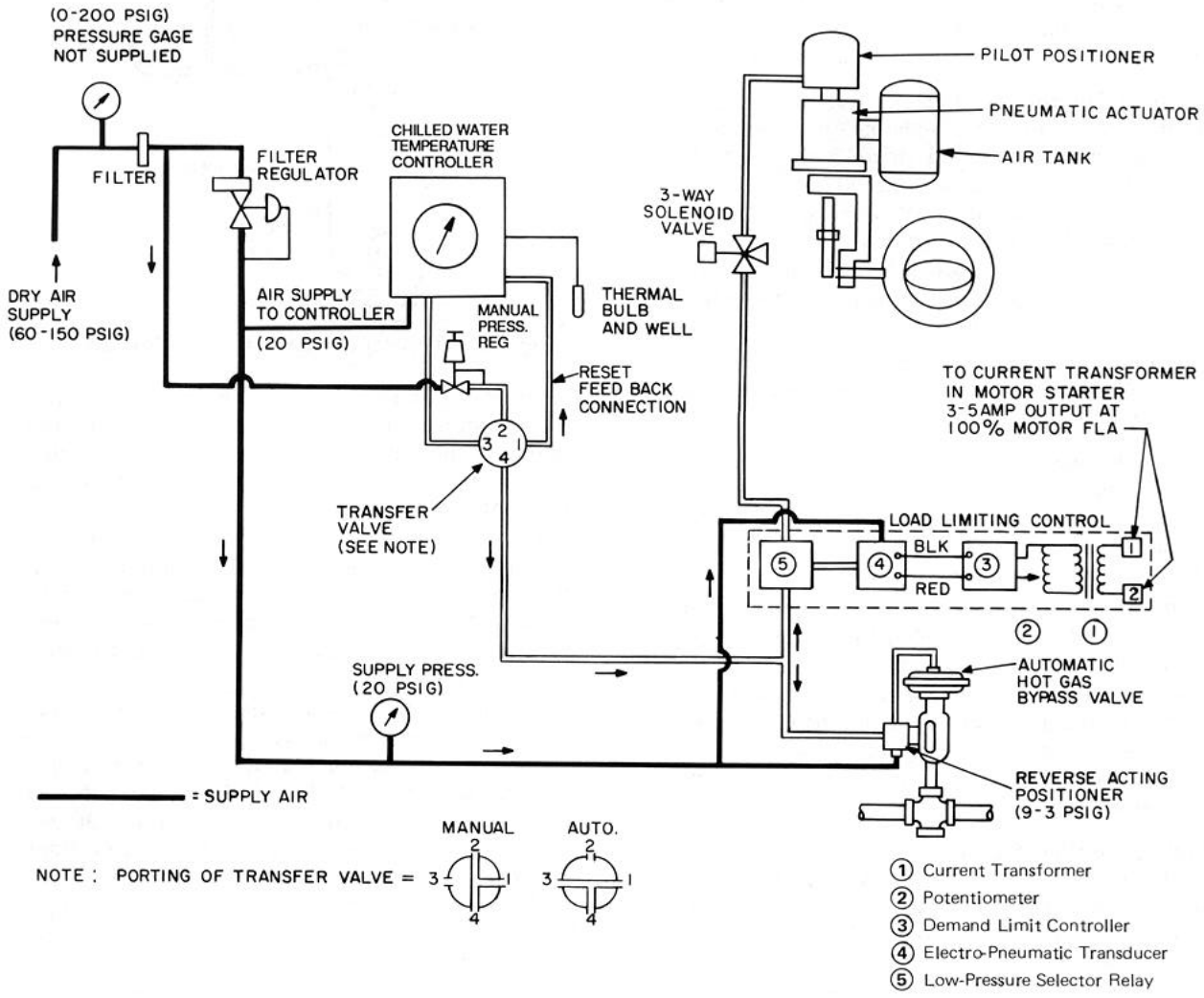

Fig. 15 – Typical Pneumatic Control System Schematic

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Instrument and Gage Piping — Certain control components of 17MPS/FA machines require pneumatic piping. Among these are the compressor suction damper pilot positioner and the chilled water temperature controller (Fig. 15). Liquid level control systems and automatic hot-gas bypass arrangements also use air pressure for their operation.

The air supply should be clean and dry, and should provide from 60 to 150 psi pressure. The main supply is then filtered and regulated to about 20 to 35 psi as required by the type of controls being regulated. See your job flow diagrams for exact pressure requirements.

Both pneumatic tubing and refrigerant tubing should be at least 3/8-in. OD for runs up to 12-ft in length, and should be 1/2-in. OD for longer runs. Refer to job flow schematics for details of tubing runs and connections.

Valved connections are normally provided where the tubing is attached to machine components. *Note, however, that valving of high-pressure safeties such as condenser high-pressure cutout is prohibited by the ANSI B9.1 refrigeration safety code.*

Piping to Turbine — Water and steam connections to the turbine should be made only after alignment between all machine and drive components has been verified as being within .002-in. in parallel and .00033-in. per inch of traverse across the coupling face in angular alignment.

Steam piping must be designed and supported so that pipe forces and moments at the turbine flanges are essentially zero.

Follow the turbine manufacturer's recommendations and all applicable codes when installing steam piping.

Hot-Gas Bypass Installation — A weld stubout or flanged pipe connection is provided on cooler and condenser (or compressor discharge pipe) when hot-gas bypass is specified. The bypass valve itself is frequently shipped loose for field erection.

Install the valve as shown on job flow diagrams. Arrow on valve body must point in direction of gas flow (from condenser to cooler).

Be sure that pipe flanges are clean and gaskets are fitting properly. Tighten flanges evenly to avoid uneven stress on valve or piping. Examine valve packing and check valve action to ensure proper operation.

Level Controller Piping — Level controllers are usually shipped to the jobsite with displacer cage and controller (Fig. 16) assembled as a single unit. Inspect the control thoroughly for possible damage. Be sure all openings are free of foreign material. On many displacers, a damping orifice can be found in the lower end of the cage; do not remove. Remove the float shipping stabilization rods at each end of the displacer.

Piping connections to the level control have been prefabricated to ensure that the displacer cage and float are at the proper height when assembled in the field. If for some reason it is possible to install the cage at more than one height, check the job drawings for the proper locating dimension.

Orient the level control assembly so that the controller (Fig. 16) is readily accessible for gage reading and for control adjustment.

Connect the controller to the proper control air supply. This is typically either 20 psig or 35 psig, depending upon control pressure requirements; check your job pneumatic control item list. Attach output tubing between controller and valve or recorder as indicated on job drawings.

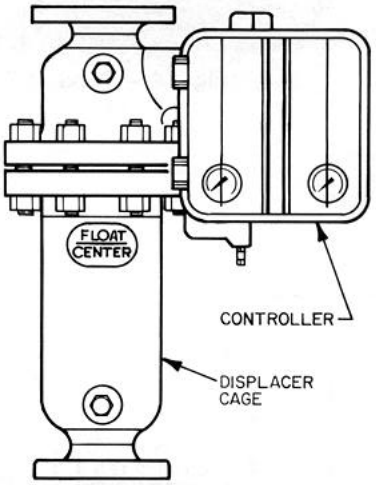

Fig. 16 — Typical Refrigerant Level Controller

Relief Valve Piping — The refrigeration machine cooler, storage tank (or receiver) and the pumpout condenser are equipped with relief valves or other relief devices in accordance with the ANSI refrigeration safety code.

→ Relief devices should be vented in accordance with the ANSI/ASHRAE 15-1978 safety code and all other codes applicable to mechanical refrigeration. *Accumulation of refrigerant in enclosed spaces will displace oxygen and can create a serious safety hazard.*

Include a flexible connection in the piping near the valve or rupture disc and be sure there is no piping stress on the relief device. Install a pipe plug near the device for leak testing. A condensation drain will prevent water build-up on the atmospheric side of the disc or valve. Cover the outdoor vent with a rain cap.

If the relief piping is manifolded into a single discharge line, the area of the common line must equal or exceed the area required for the cooler, storage tank and pumpout condenser added together.

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Purge Condensate Control System — On some outdoor installations, temperatures may drop low enough to condense refrigerant gas in the purge gas supply line. Liquid refrigerant in this line reduces the purge efficiency. A refrigerant condensate trap (Fig. 17) will effectively control premature condensation of refrigerant gas.

An alternative method of controlling condensation is heat tracing. The heat source may be steam or electric cable. Add sufficient heat to prevent condensation in the areas indicated in Fig. 12 and 13. Heat only the indicated areas in order to avoid interference with normal unit operation.

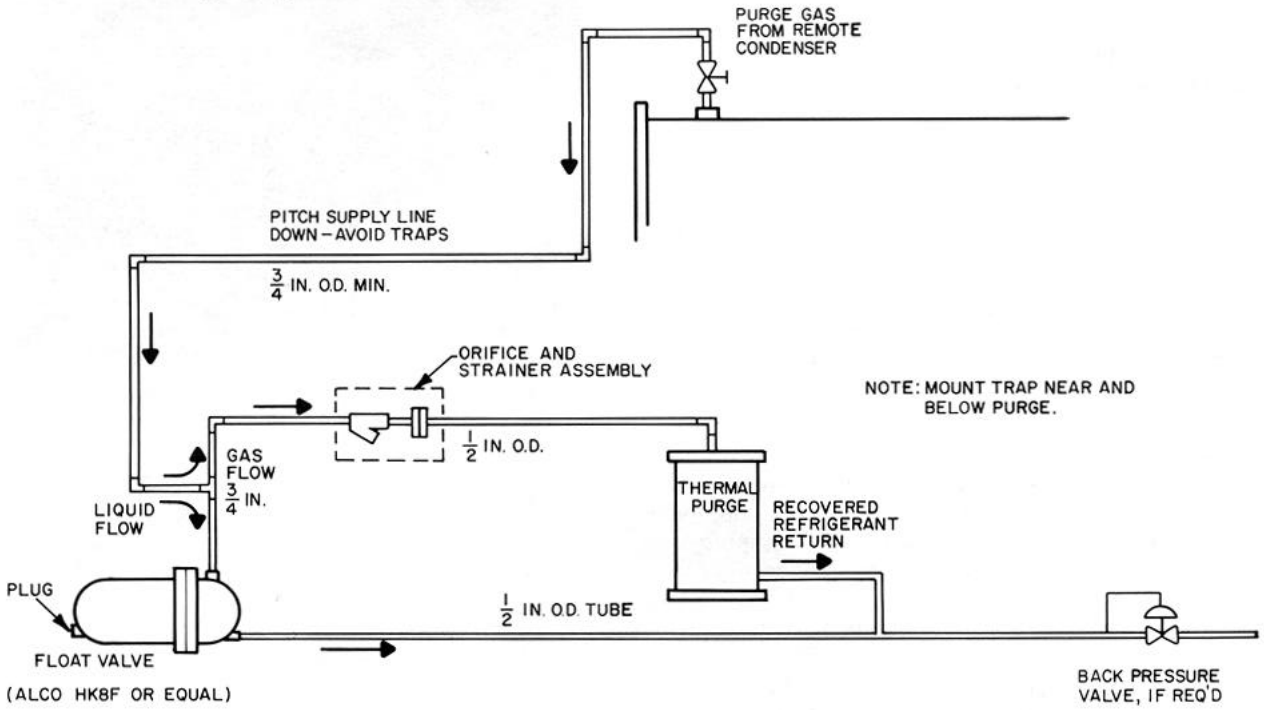
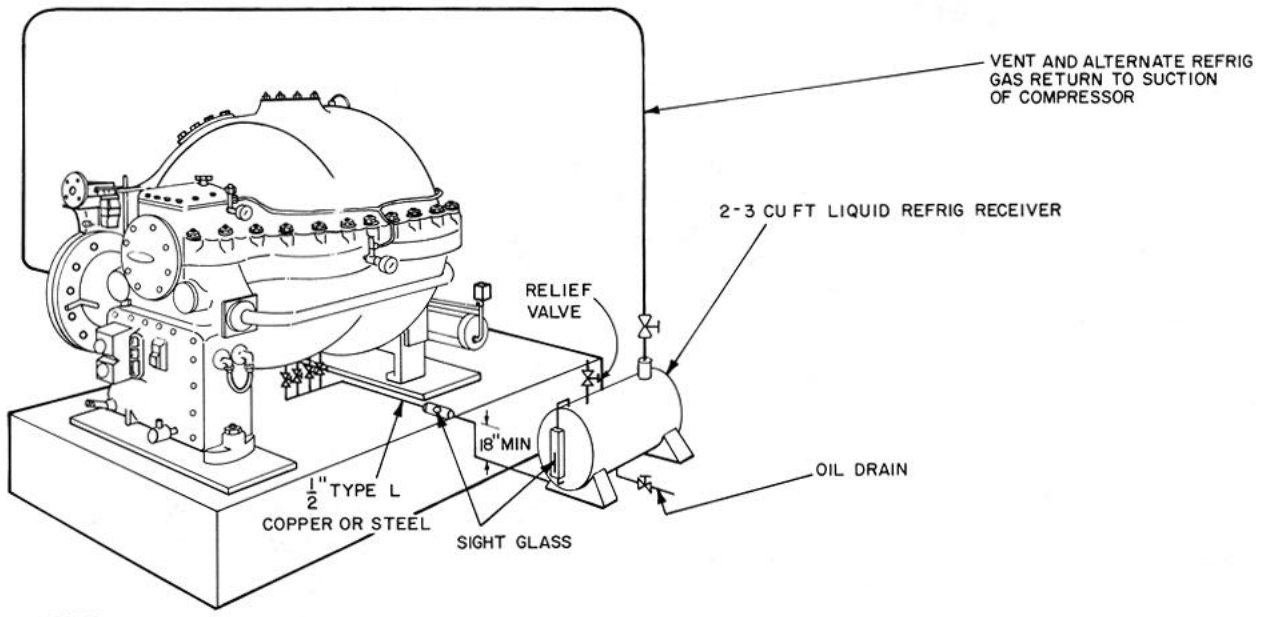


Fig. 17 — Purge Gas Condensate Trap System



NOTES:
1. Locate tank 1 – 2 ft or more below compressor.
2. Do not insulate drain tank.
3. Provide drain for oil removal.

Fig. 18 — Recommended Stage-Drain Arrangement

Contents

Compressor Stage Drains — Valved stage-drain connections are provided on all compressors for removal of any accumulation of liquid refrigerant. This liquid must be removed before the compressor is operated.

Stage drains are required under the following conditions:

1. On outdoor split systems where the compressor is not attached directly to the cooler.
2. On installations where the compressor is located below the cooler.
3. On low temperature installations below −40 F.
4. On applications where the cooler receives brine warm enough to cause refrigerant migration to colder areas such as compressor shell or condenser.
5. When specified per customer or engineering requirements. Check your job data.

Figure 18 illustrates a typical stage-drain system.

FIELD WIRING

General — Wiring must be in accordance with all applicable electrical codes and must conform to the wiring diagrams provided by Carrier and the electrical component manufacturers. Compressor motor starter must contain the components specified by Carrier as being essential to the proper operation and control of open drive centrifugal compressors.

Oil Heater and Thermostat — Wire thru a disconnect switch to the 1000-watt heater as shown on job wiring diagrams. On most compressors, an oil heater thermostat, in the oil pump chamber cover, is connected in series with the heater. Check your job wiring diagrams. On some applications, a customer-supplied flow switch in the oil cooler line activates the oil heater whenever the oil cooler water flow stops; check your job data.

Gear and turbine oil heaters, or a motor space heater if supplied, may be wired into the refrigeration machine control circuit. Follow job blueprints.

Oil Pumps — Seal-oil return pump is dual voltage. Connect to 115- or 230-volt source as indicated on pump nameplate. Wire in series with atmospheric oil chamber float switch as shown on job wiring drawings.

Check the nameplate voltage of all external electric oil pumps to be sure that it corresponds with supply voltage. Wire pumps per job wiring diagrams.

Pumpout System Wiring — Both the open drive (5F20) and hermetic (06D) pumpout unit have control systems which provide for compressor motor and pumpout system safety. A typical control circuit for each of the 2 types is shown in Fig. 19 and 20. Actual components and wiring depend upon job requirements. Follow your individual job wiring diagrams. Wiring details for 5F20 units may also be found in the 5F20 Installation Instructions.

Always check motor nameplates for proper voltage requirements.

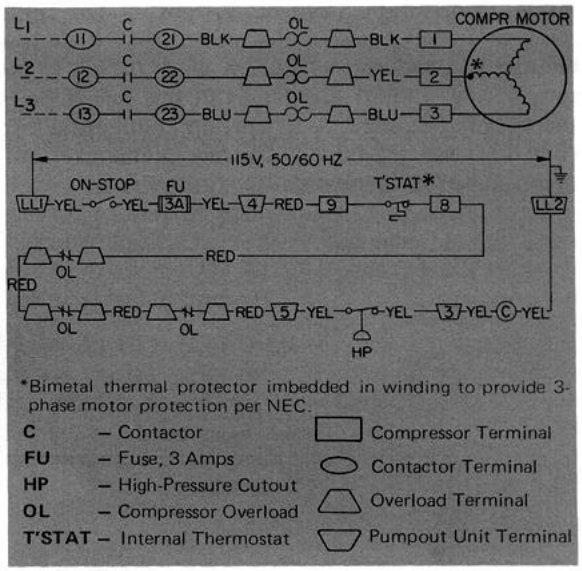


Fig. 19 — Pumpout Unit Wiring Schematic (Hermetic Compressor)

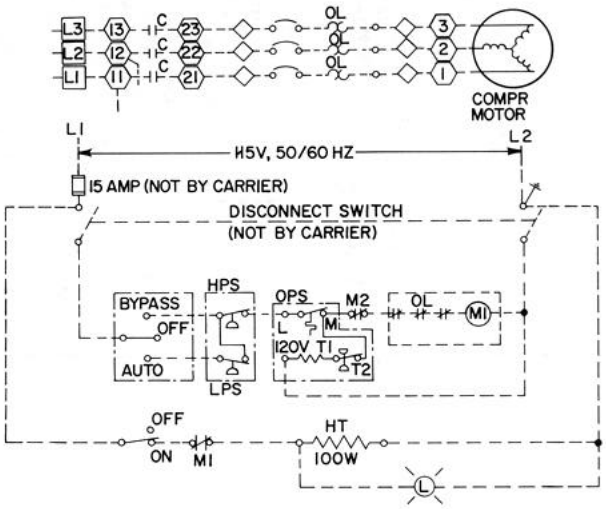


Fig. 20 — Pumpout Unit Wiring Schematic (Open-Drive Compressor)

Contents

Table 1 — Typical Refrigeration Machine Safety Controls

ITEM	SAFETY DEVICE	LOCATION	DESCRIPTION
1	Condenser High-Pressure Cutout	Panel or remote console	Sensing connection on upper part of condenser shell.
2	Cooler Low Refrigerant Cutout	Panel or remote console	Sensing element in cooler thermowell.
3	Low Brine Temperature Cutout	Normally, panel or remote console Occasionally on cooler end flange	Sensing element in tube of cooler leaving brine. Cutout not supplied on gas condensing jobs.
4	Compressor Low Oil-Pressure Cutout	Panel or remote console	Low-side connection on suction end of compressor casing. High-side connection on compressor seal housing.
5	Thrust Bearing and Seal Oil Temperature Cutouts	Compressor	Terminal box opposite drive end.
6	Shaft Excess Movement Switch	Compressor	Uses same terminal box as Item 5.
7	High Discharge Temperature Cutout	Remote console	Not supplied on all installations. Sensing element in compressor discharge line.
8	Flow Switches	Brine and condensing water pipes	Field installed. Not on all installations.
9	Load Limiting Controls	Remote console or separate enclosure	Requires electrical input from compressor motor starter.
10	Auxiliary Controls	Remote console or on controlled component	Pumpout compressor safeties, auxiliary oil pump switches, etc.
11	Anti-recycle Timer	Compressor Motor Starter	Limits electric motor starts to 3 per hour (typically).

Thermal Purge Wiring — Purge operation is controlled by an operating pressure switch and a safety pressure switch wired in series with a gas venting solenoid. An on-auto-off switch or other disconnect device (Fig. 21) may also be part of the purge circuit. Wire per job drawings.

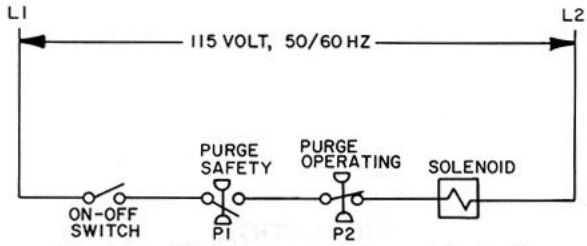


Fig. 21 — Wiring Thermal Purge (Typical)

Motorized (Type "L") Purge Wiring — The purge motor is normally wired thru a customer-supplied starter and fused disconnect. A customer-supplied on-off switch is usually placed in the purge control circuit.

Check purge motor nameplate for proper electrical supply and wire per job drawings.

Wiring to Safety Controls — Depending upon job specifications, 17MPS/FA machines are provided with a gage and control panel for field mounting, or with a remote control console. Panel or console contain the necessary machine safety controls plus operating-condition gages. Remote consoles may also be equipped with indicating lights and alarm and may contain drive and gear safeties and various auxiliary controls.

Table 1 lists controls used on most applications. Your machine may differ in the number or type of controls; check your job data.

Locate and identify each safety control by means of the Refrigeration Machine Flow Schematic and Item List. Wire as indicated on Electric and Pneumatic Control Diagram.

TESTING

Packaged Machines — 17MPS/FA machines which have been factory pre-assembled and shipped as a unit contain a holding charge. Leak testing on these machines may be performed at any time prior to machine start-up. Dehydration is recommended only if the machine has been opened or if the machine holding charge has been completely lost. *Record cooler gage reading and ambient temperature at time of installation.* This information will be required when leak testing.

Refer to machine Initial Start-Up Instructions for leak test and dehydration procedures.

Field Erected Machines — When the refrigerant side of the machine has been fully assembled, test the machine for leak tightness and then dehydrate under vacuum to remove all moisture. *Perform dehydration before adding insulation.*

PRESSURE TEST

1. Add clean dry air or nitrogen thru the cooler charging valve until listed test pressure is reached. Do not exceed test pressure.

→

REFRIG	TEST PRESS.
CFC-12 HFC-134a CFC-500	125 psig
CFC-114	30 psig
HCFC-22	190 psig

2. Soap test all joints.
3. Check for overnight (8 hr min) pressure loss. Allow for changes in ambient temperature. Pressure increases or decreases about 0.5 psi for every 10 F change in temperature.
4. If leaks are found, reduce machine pressure to 0 psig, repair leaks and repeat test. If machine appears to be tight (no observable pressure loss in 1 hr), proceed with refrigerant pressure test.

REFRIGERANT PRESSURE TEST

1. Reduce machine pressure below ambient refrigerant pressure and add 25 lb of the proper refrigerant.

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2. Raise Machine pressure again to previous test pressure, using dry air or nitrogen, and test all joints with halide or electronic leak detector.
3. Repair any leaks and retest to ensure repair.

→ STANDING VACUUM TEST — When performing the standing vacuum test, or machine dehydration, use a manometer or a wet bulb indicator; dial gages cannot indicate the small amount of leakage acceptable during a short period of time.

1. Attach an absolute pressure manometer or wet bulb indicator to the machine.
2. Evacuate the vessel to 22 in. Hg vac, ref 30-in. bar (4.0 psia) (28 kPa), using a vacuum pump or the pumpout unit.
3. Valve off the pump to hold the vacuum and record the manometer or indicator reading.
4. a. If the leakage rate is less than 0.05 in. Hg (.17 kPa) in 24 hours, the machine is sufficiently tight.
   b. If the leakage rate exceeds 0.05 in. Hg (.17 kPa) in 24 hours, repressurize the vessel and test for leaks. Use nitrogen and a refrigerant tracer. Raise the vessel pressure in increments until the leak is detected. Limit the leak test pressure to 190 psig (1310 kPa) to the appropriate pressures found in Step 1 of PRESSURE TEST section.
5. Repair leak, retest, and proceed with dehydration.

→ MACHINE DEHYDRATION — Dehydration is recommended if the machine has been open for a considerable period of time, the machine is known to contain moisture, or there has been a complete loss of machine holding charge or refrigerant pressure.

Dehydration is readily accomplished at room temperatures. Use of a cold trap (Fig 22) may substantially reduce the time required to complete the dehydration. The higher the room temperature, the faster dehydration takes place. At low room temperatures, a very deep vacuum is required for boiling off any moisture. If low ambient temperatures are involved, contact a qualified service representative for the dehydration techniques required.

Perform dehydration as follows:

1. Connect a high capacity vacuum pump (5 cfm [.002m^3/s] or larger is recommended) to the refrigerant charging valve. Tubing from the pump to the machine should be as short and as large a diameter as possible to provide least resistance to gas flow.
2. Use an absolute pressure manometer or a wet bulb vacuum indicator to measure the vacuum. Open the shutoff valve to the vacuum indicator only when taking a reading. Leave the valve open for 3 minutes to allow the indicator vacuum to equalize with the machine vacuum.
3. Open all isolation valves, if present, if the entire machine is to be dehydrated.
4. With the machine ambient temperature at 60 F (15.6 C) or higher, operate the vacuum pump until the manometer reads 29.8 in. Hg vac, ref 30 in. bar. (0.1 psia) (−100.61 kPa) or a vacuum indicator reads 35 F (1.7 C). Operate the pump an additional 2 hours.

   Do not apply greater vacuum than 29.82 in Hg vac (757.4 mm Hg) or go below 33 F (.56 C) on the wet bulb vacuum indicator. At this temperature/pressure, isolated pockets of moisture can turn into ice. The slow rate of evaporation (sublimination) of ice at these low temperatures/pressures greatly increases dehydration time.
5. Valve off the vacuum pump, stop the pump, and record the instrument reading.
6. After a 2-hour wait, take another instrument reading. If the reading has not changed, dehydration is complete. If the reading indicates vacuum loss, repeat Steps 4 and 5.
7. If reading continues to change after several attempts, perform a leak test up to the maximum 190 psig (1310 kPa) pressure. Locate and repair the leak, and repeat dehydration.

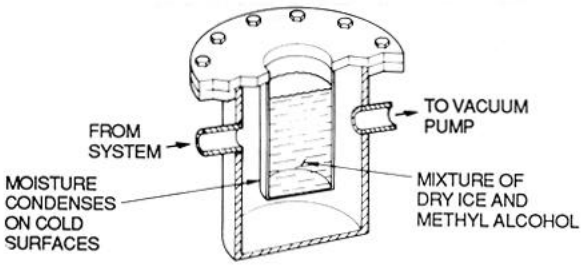

Fig. 22 — Dehydration Cold Trap

INSULATION

Insulation Areas — The extent of insulation is determined by machine operating conditions and is established on a ''per job'' basis. Check your job data. Normal areas for insulation include the following:

1. Cooler shell and support feet
2. Cooler water boxes
3. Chilled water (brine) piping
4. Suction piping
5. Economizer, including piping to cooler and compressor
6. Hot-gas bypass line from cooler to valve

Insulation Requirements

1. Do not insulate until leak testing and dehydration have been completed.
2. Insulation must be vaportight and thick enough to prevent sweating.
3. Leave all nameplates uncovered.
4. Do not insulate thermowells. Maintain accessibility.
5. Bevel insulation around sight glasses to permit unimpeded observation (Fig. 23).
6. Insulation finish must be vapor tight, neat and durable. Check job requirements for other specifications. Apply a durable paint to insulated areas.

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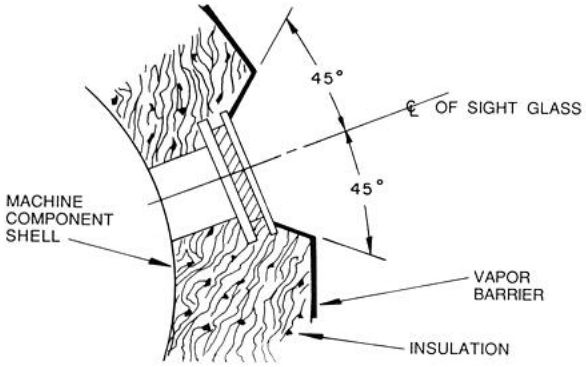

Fig. 23 — Sight Glass — Insulation Clearance

FINAL MACHINE ALIGNMENT

Compressor and drive alignment should be rechecked after all piping, including water and steam, has been completed.

The procedures and tolerance requirements for final alignment are given in Carrier Standard Service Techniques Book, SM-15.

Do not dowel compressor and drive components until the machine has been operated and hot checked.

Coupling Guards — To prevent injury to machine operator and other personnel from contact with rotating shafts or couplings, and to prevent oil and grease spatter from endangering eyesight, coupling must be adequately covered at any time the machine is running. Install guards as soon as final alignment has been completed and before hot alignment check.

Operating this equipment without coupling guards in place may result in serious injury.

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Book 2 Tab 5d | PC 211 | Catalog No. 531-744 | Printed in U.S.A. | Form 17MPS-3SI | Pg 20 | 1094 | 11-79 | Replaces: 17MPS-2SI